REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. **PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.**

1. REPORT DATE	2. REPORT TYPE Viewgraphs	3. DATES COVERED

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
NexGenBus Testing Brief (Viewgraphs)	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)	5d. PROJECT NUMBER
Sid Jones	5e. TASK NUMBER
	5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)	8. PERFORMING ORGANIZATION REPORT NUMBER
Naval Air Warfare Center Aircraft Division 22347 Cedar Point Road, Unit #6 Patuxent River, Maryland 20670-1161	

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
Naval Air Systems Command 47123 Buse Road Unit IPT Patuxent River, Maryland 20670-1547	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON Sid Jones
a. REPORT	b. ABSTRACT	c. THIS PAGE			19b. TELEPHONE NUMBER (include area code)
Unclassified	Unclassified	Unclassified	Unclassified	14	(301) 342-1601

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39-18

NexGenBus

Fibre Channel

Test and Evaluation

Approach

- Objective:
  - Determine as reasonably possible, can Fibre Channel meet our future Operational Requirements.
- Methods:
  - Analysis
  - Demonstration
  - Simulation

10/7/99   2

20000407 172

Methods

- Analysis
  - Port Functions
    - Physical Plant
    - Transmission Protocol
    - Signaling Protocol
  - Node Functions
    - Common Services
    - Mapping Layer for Upper-Level Protocol

10/7/99

3

Analysis Method

- Port Functions
  - Physical Plant
    - Cable assemblies
      - Balanced transmission line
      - Unbalanced transmission line
      - Connectors
      - Operational Environmental
    - Transmitters and Receivers
      - clock recovery
      - bit error detection

10/7/99

4

Analysis Method

- Port Functions (continued)
  - Transmission Protocol
    - 8b/10b encoding/decoding
      - ensures a minimum number of clock transitions while maintaining a dc balance and providing word alignment
    - ordered sets
      - identify frame boundaries and maintain the link
  - Signaling Protocol
    - defines the rules for transferring blocks of data
      - frame structure and byte sequences

10/7/99   5

Analysis Method

- Node Functions
  - Common Services
    - a set of services that are common across multiple ports of a node
  - Mapping Layer
    - defines the steps required to perform the functions identified by a Upper-Level Protocol
      - for each ULP there is a corresponding mapping
      - a construct for establishing the endpoint of the node

10/7/99   6

Analysis Results

- Determined that most of the test elements could not be isolated for testing.
- Identify specific test objectives for Demonstration and Simulation.
  - Demonstration
    - Physical plant
  - Simulation
    - Node to Node functions

10/7/99

7

Analysis Results

- Test objectives for Demonstration
  - Physical Plant
    - Eye-diagram waveform test
    - Cable interoperability test
    - Transmission rate test
    - Noise rejection test

10/7/99

8

Analysis Results

- Cable assemblies for the tests
  - Gore Quad (balanced pair)
    - FCN-1056 w/Mil-C-38999 style connector
  - Mil-C-17/94 (unbalanced)
    - RG-179 w/BNC connector
  - Mil-C-17/110 (unbalanced)
    - RG-302 w/BNC connector

10/7/99   9

Analysis Results

- Test objectives for Simulation
  - Node to Node functions
    - Class of Service
    - Latency
    - Synchronicity
    - Topologies
    - Upper-Level Protocols

10/7/99   10

Methods

- Demonstration
  - Eye-diagram waveform
    - overall signal quality
  - Cable interoperability
    - meet the specific requirements
  - Transmission rate
    - maximum frame data rate
  - Noise rejection
    - simulate EMI interference

10/7/99   11

Demonstration Method

- Eye-diagram waveform
  - Jitter
    - bit times
    - differential skew
    - rise and fall times
  - Noise
    - amplitude

10/7/99   12

Eye-diagram Waveform

Typical Eye Pattern

Eye Response

Time
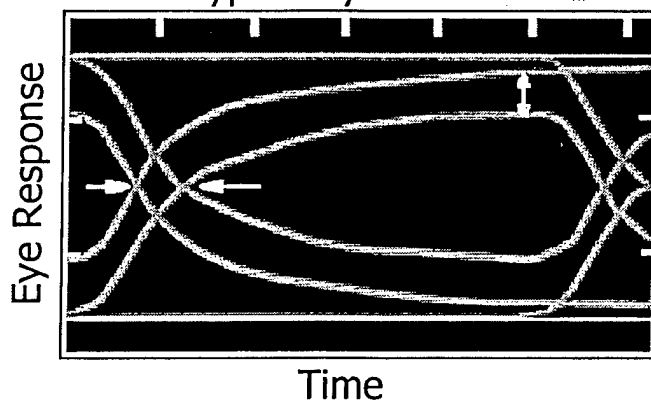
Demonstration Method

- Cable interoperability
  - cable length
  - connector loss
- Transmission rate
  - maximum frame data rate
- Noise rejection
  - signal to noise ratio

Demonstration Method

- Test data transmission
  - valid Fibre Channel data sequences
    - low frequency pattern (106.25Mhz)
    - low transition density pattern (433433...)
    - jitter tolerance pattern (50%, 100%, 30%, ...)
    - random data pattern
    - supply noise data pattern (...D31.3, ...)

10/7/99   15

Demonstration Method

- General Test Setup

10/7/99   16

Demonstration Method

- Quad Cable Layout
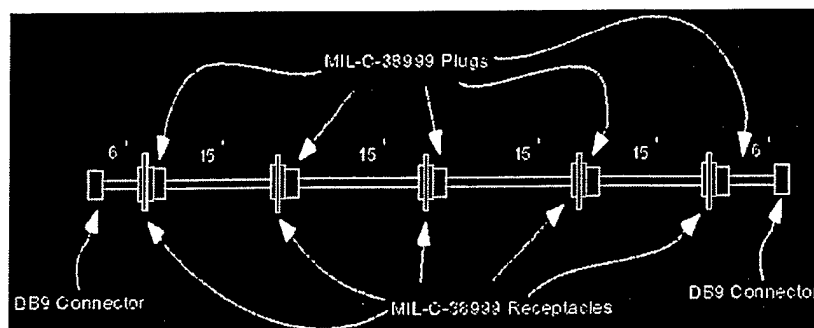
Demonstration Method

- Noise Test Setup
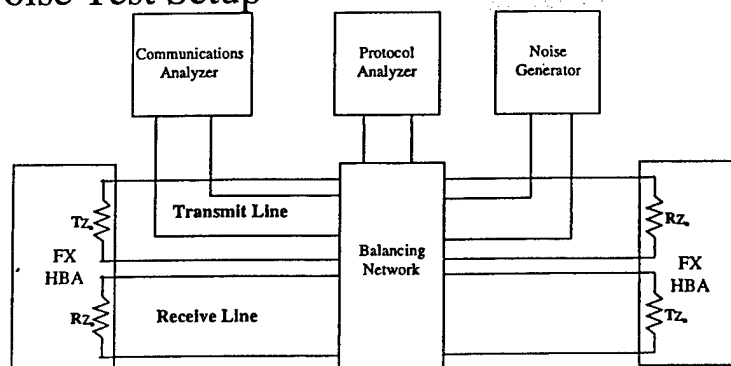
Z_o = Nominal Characteristic Impedance

Transmit Eye Pattern

Gore Quad Cable Results

RG-179 Cable Results

Color grade is enabled...
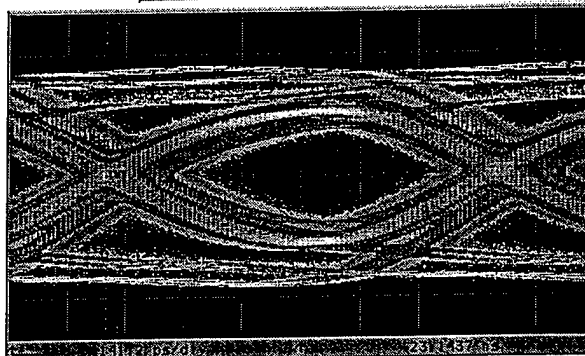
10/7/99

21

RG-302 Cable Results

Color grade is enabled...
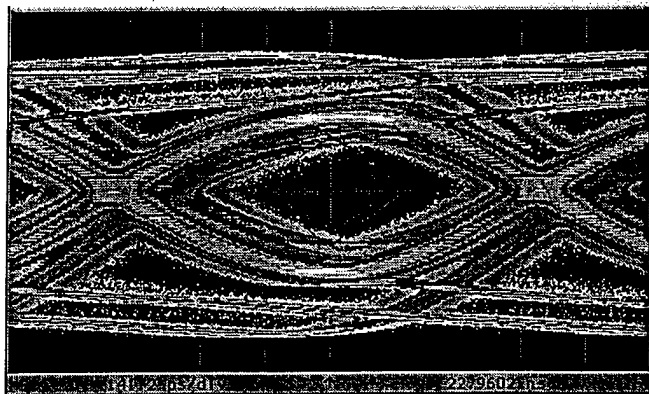
10/7/99

22

Noise Results
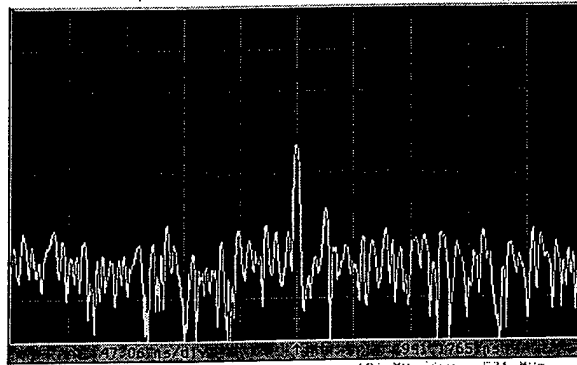
10/7/99

23

Physical Plant Summary

- Summary table
  - dB loss per meter
  - dB loss per connector
  - Maximum Lengths
  - Transmission Rate performance
  - Noise Rejection performance

10/7/99

24

Physical Plant Summary

Cable	Cable Loss (dB/m)	Conn. Loss (dB/Con)	Max Cable Length (m)	Trans. Rate (MB/s)	S/N Ratio
Quad	.138	.45	20	93	2.38
RG-179	.62	.50	10	90	4.25
RG-302	.288	.25	25	90	3.5

10/7/99   25
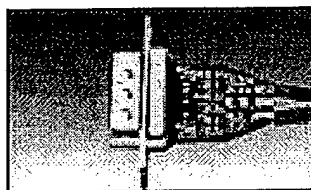
Close

- One Giga-baud data rate with copper media
- Quad and coax cables perform well
- Quad cable has excellent signal integrity - however, highest cost
- Coax cables have good performance and low cost --- isolated grounds?
- Whats next?

10/7/99   26

Why not STP?

- standard specifies for 266Mbaud (1/4x)
- Equalization
  - for long lengths
  - fixed cable assemblies
  - solid conductor?

10/7/99

27